UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,177	02/16/2004	Jian Wu	M61.12-0592	1736

27366 7590 02/05/2008

WESTMAN CHAMPLIN (MICROSOFT CORPORATION)
SUITE 1400
900 SECOND AVENUE SOUTH
MINNEAPOLIS, MN 55402-3319

EXAMINER	
SIEDLER, DOROTHY S	

ART UNIT	PAPER NUMBER
2626	

MAIL DATE	DELIVERY MODE
02/05/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/780,177	WU ET AL.	
	Examiner	Art Unit	
	Dorothy Sarah Siedler	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-23 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-23 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 13-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 13 recites, a "computer readable medium having computer-executable instructions for performing steps comprising:", however this is non-statutory. The claimed computer readable medium is disclosed in the specification (Page 6) as communication media, which includes a carrier wave. A carrier wave is simply a signal and non-statutory, thus rendering claim 13 non-statutory.

Claims 14-23 depend from claim 13, thus incorporating all the limitations therefrom, and are therefore rejected for similar reasons.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1- 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over ***Acero*** ("Environmental Robustness in Automatic Speech Recognition" IEEE 1990) in view of ***Arslan*** (5,706,395).

As per claim 1, ***Acero*** discloses a method of identifying a clean speech signal from a noisy speech signal, the method comprising:

receiving an observation vector representing a segment of a noisy speech signal (page 849-850, section 2, *a speech signal with uncorrelated additive noise*);

estimating a clean speech value and a noise value based on the observation vector (page 850, section 4, *an ML estimator is used to determine the noise vectors, then an MMSE estimator is used to estimate the uncorrupted (clean speech)vector*).

However, ***Acero*** does not disclose using the clean speech value and the noise value to set a gain for a filter, and applying the observation vector to the filter to produce a filtered clean speech vector representing a segment of a clean speech signal. ***Arslan***

discloses a system that uses a wiener filter for noise suppression. Using the wiener filter, spectral subtraction is performed using speech and noise estimates (column 11 lines 25-37), thus outputting clean speech. All of the claimed elements are disclosed in ***Acero*** and ***Arslan,*** and both techniques are used during speech normalization prior to speech recognition. The only difference is the combination of these known elements, i.e. using the method disclosed in ***Acero*** to estimate the clean and noise speech values, which are then used in the filter system disclosed in ***Arslan***.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the clean speech value and the noise value to set a gain for a filter, and apply the observation vector to the filter to produce a filtered clean speech vector representing a segment of a clean speech signal in ***Acero***, since one of ordinary has good reason to pursue the options within his or her technical grasp in order to achieve the predictable result of developing a noise suppression system that is robust changing input, as indicated in both ***Acero*** (Abstract) and ***Arslan*** (column 11 lines 25-37 and lines 60-66).

As per claim 2, ***Acero*** in view of ***Arslan*** disclose the method of claim 1, and ***Acero*** further discloses wherein estimating a clean speech value and a noise value comprises using parameters that describe a distribution of noise values (page 850, section 4.2, *ML estimation of noise*).

As per claim 3, ***Acero*** in view of ***Arslan*** disclose the method of claim 2, and ***Acero*** further discloses comprising determining the parameters of the distribution of noise values (page 850, section 4.2, *ML estimation of noise*).

As per claim 4, ***Acero*** in view of ***Arslan*** disclose the method of claim 3, and ***Acero*** further discloses wherein determining the parameters of the distribution of noise values comprises determining the parameters based on multiple segments of the noisy speech signal (page 850, section 4.2, *ML estimation of noise*).

As per claim 5, ***Acero*** in view of ***Arslan*** disclose the method of claim 3, and ***Acero*** further discloses wherein determining the parameters of the distribution of noise values comprises determining a mean of the distribution of noise values using an iteration (page 850, section 4.2, *ML estimation of noise*).

As per claim 6, ***Acero*** discloses the method of claim 5, and ***Acero*** further discloses wherein determining a mean of the distribution of noise values using an iteration comprises at each iteration updating the mean by adding a value to the value of the mean in a past iteration, the value added to the mean not being computed based on a product formed between a covariance of the noise distribution and a difference between

the observation vector and another value (page 850, section 4.2, *the EM algorithm is used to obtain ML soltions*).

As per claim 7, ***Acero*** discloses the method of claim 1, however ***Acero*** does not disclose wherein setting a gain for a filter comprises defining the gain as a ratio with the denominator of the ratio comprising the sum of the clean speech value and the noise value. ***Arslan*** discloses a wiener filter where the gain ratio denominator is the sum of the clean speech value and the noise value (column 11 lines 25-35). In addition, a generalized wiener filter commonly uses a gain ratio where the denominator is the sum of the speech and noise value.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have the gain ratio for a filter defined with the denominator of the ratio comprising the sum of the clean speech value and the noise value in ***Acero***, since one of ordinary skill in the art has good reason to pursue the options within his or her technical grasp in order to achieve the predictable result of designing a robust noise suppression filter.

As per claim 8, ***Acero*** in view of ***Arslan*** disclose the method of claim 7, however ***Acero*** does not disclose wherein defining the gain as a ratio further comprises defining a ratio with a numerator that is a function of the clean speech value and the noise value.

Arslan discloses defining the gain as a ratio with the numerator that as a function of the clean speech and noise value (column 11 lines 25-35, *the filter gain numerator is an estimate of the input speech signal, which is a function of the clean and noisy speech*).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have the gain ratio for a filter defined with a numerator that is a function of the clean speech value and the noise value in ***Acero***, since one of ordinary skill in the art has good reason to pursue the options within his or her technical grasp in order to achieve the predictable result of designing a robust noise suppression filter.

As per claim 9, ***Acero*** in view of ***Arslan*** disclose the method of claim 7, however ***Acero*** does not disclose wherein defining the gain as a ratio comprises defining the ratio such that it is guaranteed to be positive if the clean speech value and the noise value are positive. ***Arslan*** discloses wherein defining the gain as a ratio comprises defining the ratio such that it is guaranteed to be positive if the clean speech value and the noise value are positive (column 11 lines 25-37).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to define the ratio such that it is guaranteed to be positive if the clean speech value and the noise value are positive in ***Acero***, since one of ordinary skill in the art has good reason to pursue the options within his or her technical grasp in order to achieve the predictable result of designing a robust noise suppression filter.

As per claim 10, ***Acero*** in view of ***Arslan*** disclose the method of claim 1, and ***Acero*** further discloses wherein the observation vector has been formed without applying a frequency-based transform (Abstract, *the technique uses cepstral vectors*).

As per claim 11, ***Acero*** in view of ***Arslan*** disclose the method of claim 1, and ***Acero*** further discloses wherein estimating a clean speech value and a noise value comprises using a parameter that describes the covariance of a residue error (page 850, section 4.2, *ML estimation*).

As per claim 13, ***Acero*** discloses a computer-readable medium having computer-executable instructions for performing steps comprising:

obtaining an estimate of a clean speech value and an estimate of a noise value derived from a noisy speech signal (page 850, section 4, *an ML estimator is used to determine the noise vectors, then an MMSE estimator is used to estimate the uncorrupted (clean speech)vector*);

However, ***Acero*** does not disclose setting a numerator of a filter gain ratio as a function of the clean speech value and the noise value, setting a denominator of the filter gain ratio as a function of the clean speech value and the noise value, and using

the filter gain ratio in a filter that is applied to the noisy speech signal. ***Arslan*** discloses using a wiener filter for noise suppression, where the gain ratio is defined as a ratio with the numerator as a function of the clean speech and noise value (column 11 lines 25-35, *the filter gain numerator is an estimate of the input speech signal, which is a function of the clean and noisy speech*), and the denominator is the sum of the clean speech value and the noise value (column 11 lines 25-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to set a numerator of a filter gain ratio as a function of the clean speech value and the noise value, set a denominator of the filter gain ratio as a function of the clean speech value and the noise value, and use the filter gain ratio in a filter that is applied to the noisy speech signal in ***Acero***, since one of ordinary skill in the art has good reason to pursue the options within his or her technical grasp in order to achieve the predictable result of designing a robust noise suppression filter.

As per claim 14, this claim recites limitations similar to those recited in claim 2, and is therefore rejected for similar reasons.

As per claim 15, this claim recites limitations similar to those recited in claim 3, and is therefore rejected for similar reasons.

As per claim 16, this claim recites limitations similar to those recited in claim 4, and is therefore rejected for similar reasons.

As per claim 17, ***Acero*** in view of ***Arslan*** disclose the computer-readable medium of claim 16, and ***Acero*** further discloses wherein determining the parameter comprises determining a mean iteratively, wherein each iteration utilizes an update equation that is formed by maximizing the joint probability of a sequence of observation vectors and a sequence of mixture component indices (page 850, section 4.2, *ML estimation of noise*).

As per claim 18, ***Acero*** in view of ***Arslan*** disclose the computer-readable medium of claim 13, and ***Acero*** further discloses wherein obtaining an estimate of a clean speech value and an estimate of a noise value comprises estimating a cepstral clean speech value and a cepstral noise value in a cepstral domain and converting the cepstral clean speech value and the cepstral noise value into the spectral domain to produce a spectral domain clean speech value and a spectral domain noise value (Abstract and Figure 1, *speech and noise vectors are cepstral vector, and Figure 1 displays the speech and noise spectrum from the stereo database. Therefore it is inherent the cepstral values are converted to spectrum values*).

As per claim 19, ***Acero*** in view of ***Arslan*** disclose the computer-readable medium of claim 18, however ***Acero*** does not disclose wherein obtaining an estimate of a clean speech value and an estimate of a noise value further comprises smoothing the spectral domain clean speech value and the spectral domain noise value across frequencies. ***Arslan*** discloses smoothing prior to filtering by the wiener filter (column 8 lines 14-40).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to smooth the spectral domain clean speech value and the spectral domain noise value across frequencies in ***Acero***, since it reduces noise fluctuations in the filtered speech signal, as indicated in ***Arslan*** (column 8 lines 25-28).

As per claim 20, ***Acero*** in view of ***Arslan*** disclose the computer-readable medium of claim 18, however ***Acero*** does not disclose wherein obtaining an estimate of a clean speech value and an estimate of a noise value further comprises smoothing the spectral domain clean speech value and the spectral domain noise value across time. ***Arslan*** discloses smoothing prior to filtering by the wiener filter (column 8 lines 14-40).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to smooth the spectral domain clean speech value and the spectral domain noise value across frequencies in ***Acero***, since it reduces noise fluctuations in the filtered speech signal, as indicated in ***Arslan*** (column 8 lines 25-28).

As per claim 21, ***Acero*** in view of ***Arslan*** disclose the computer-readable medium of claim 13, and ***Acero*** further wherein obtaining an estimate of the noise value comprises utilizing a parameter that describes a distribution for a residue error (page 850, section 4.2, *ML estimation of noise*).

As per claim 23, this claim recites limitations similar to those recited in claim 9, and is therefore rejected for similar reasons.

Allowable Subject Matter

Claims 12 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dorothy Sarah Siedler whose telephone number is 571-270-1067. The examiner can normally be reached on Mon-Thur 9:30am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on 571-272-7602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DSS

RICHEMOND DORVIL
SUPERVISORY PATENT EXAMINER